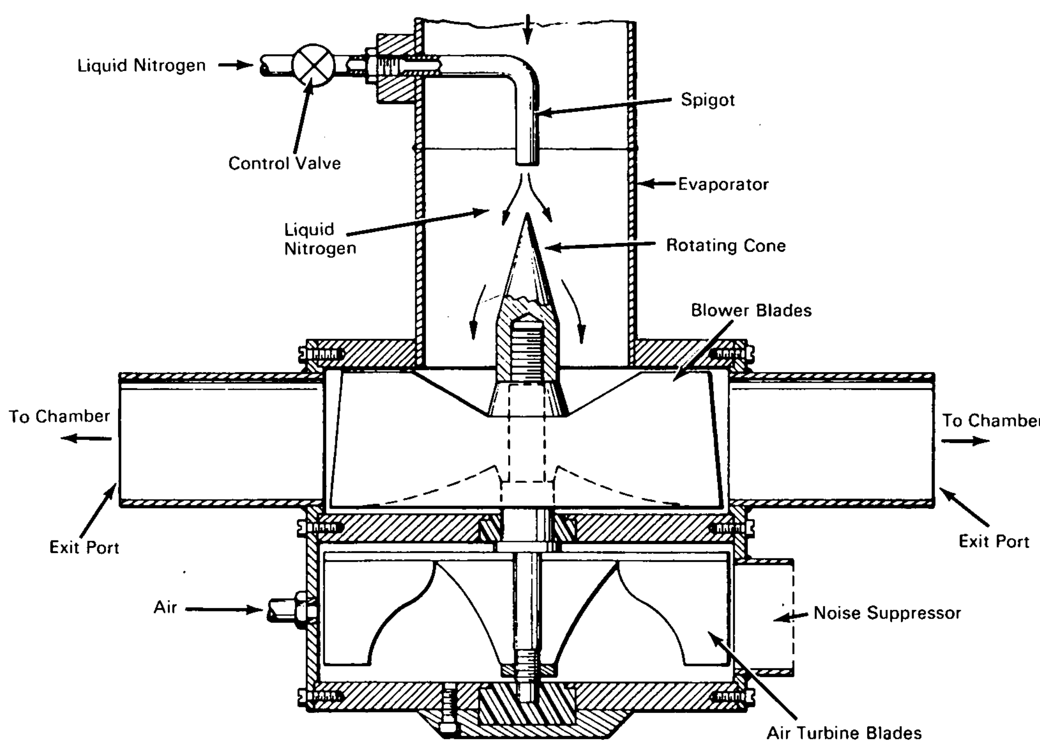
NASA TECH BRIEF

Dual-Purpose Chamber-Cooling System



An inexpensive, portable system has been designed for cooling small environmental test chambers with a temperature-controlled gas stream evaporated from a cryogenic liquid, such as liquid nitrogen. This system is particularly suitable for use at remote test sites where small tanks of cryogenic liquids can provide steady, regulated gas streams. Systems with mechanical pumping to achieve cryogenic coolant circulation are limited to the tank temperature of the cryogenic fluid. Prior-art cooling systems which depend on evaporation of cryogenic liquids are of elaborate design, incorporating expensive heat exchangers and computer servo control to achieve steady-temperature gas streams. The new system will, without elaborate controls or equipment, reduce the temperature of a chamber to any desired point (depending on the cryogenic coolant used) between the low temperature of the cryogenic liquid and the ambient temperature in a fraction of the time required by previous systems. Any blower or gas turbine can be used with the

(continued overleaf)

new system. Its low cost is particularly advantageous in work with detonating devices or other high explosives where total destruction of the test chamber and cooling system has been known to occur on occasion.

The system combines an evaporation zone with a high-velocity standard gas blower or turbine. It operates in conjunction with a storage tank containing a cryogenic liquid and having a valve which provides a controllable flow of this liquid. In start-up operation, the blower blades, driven by the air turbine, force the coolant gas (cold nitrogen, in this case) to circulate through the exit ports from the blower into the chamber (not shown). At the same time, gas (nitrogen) from the chamber is drawn into the evaporator and then recirculated through the blower. The cryogenic liquid from the supply tank (shown as liquid nitrogen) issues as a slow trickle from the spigot when the control valve to the evaporator is opened. This trickle of liquid nitrogen partly evaporates as it impinges on the rotating cone, which also serves as a flow divider. The cone, of machined solid metal, is attached to the blower blade. The cone achieves an even distribution of the liquid nitrogen trickle between the blades of the blower and greatly accelerates the evaporation process.

In the case of liquid nitrogen, it has been found possible to achieve any temperature between approximately ambient and −300°F by adjusting the control valve. The high velocity of cold recirculating gas tends to minimize temperature differences in the system and therefore maintain a stable temperature in the environmental chamber.

Note:

Documentation for the invention is available from:
Clearinghouse for Federal Scientific
and Technical Information
Springfield, Virginia 22151
Price $3.00
Reference: B68-10506

Patent status:

This invention is owned by NASA, and a patent application has been filed. Royalty-free nonexclusive licenses for its commercial use will be granted by NASA. Inquiries concerning license rights should be made to NASA, Code GP, Washington, D.C. 20546.

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